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(19) (CA) **CANADIAN PATENT** (12)

(54) BOILING WATER DISPENSER

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ABSTRACT FOR THE DISCLOSURE

A boiling water dispenser which includes a cold water tank and a hot water tank which is fed with boiling water only when water boils in a boiling chamber. The boiling chamber is fed by the cold water tank and is situated within the hot water tank. The dispenser also includes condensers to ensure no escape of steam and safety switches to cut off power to one or more of electrical heating elements on failure of the water supply or when the hot water tank is full of boiling water.

This invention relates to improvements in or relating to boiling water dispensers which heat water to boiling point, store the water at boiling temperatures and allow boiling water to be periodically drawn off and replenished without causing undue cooling of the remaining boiling water.

Conventional water heaters suffer from the disadvantage that, as the water in the heater is removed, the heater has to be replenished with cold water which then mixes with the boiling water within the heater to cause a sudden drop in temperature of the remaining water in the heater. Liquid storage and heating units have also been proposed in which a cold water tank is separated from the area of the tank containing the hot water so that addition of further cold water does not have the effect of reducing the temperature of all the water within the tank. However, a problem that can be frequently encountered with such equipment is that the interior of the equipment can become clogged with scale and other contaminants which may enter with the water supply.

It is an object of the present invention to provide an improved boiling water dispenser.

According to the present invention there is provided a boiling water dispenser comprising a tank for cold water in fluid communication with a boiling chamber, said boiling chamber being positioned within a tank for hot water and having means to boil the water, the boiling chamber having an upwardly extending expansion pipe which is arranged in use to feed the boiling water to the hot tank only when the water boils in the boiling chamber, and an outlet positioned in the

hot tank to allow boiling water to be dispensed from the dispenser, the water within the hot tank being maintained at boiling temperature due to conduction of heat from the heating means through the boiling chamber.

Preferably the free end of the expansion pipe terminates at a level above the normal static level of water in the cold water tank so that water only escapes to the hot water tank by percolating over the free end of the expansion pipe due to boiling in the boiling chamber. The cold water tank is preferably positioned above the hot water tank and the boiling chamber comprises a glass enclosure fed at one end by a conduit from the cold water tank and having the expansion pipe extending upwardly from the opposite end.

In a preferred embodiment a primary heating element and a pilot heating element are positioned within the boiling chamber. A primary switching means is provided to sense the level of boiling water in the hot tank so that at a predetermined level the primary heating element is cut off leaving only the pilot element to maintain the water within the hot tank at boiling temperature. A secondary switching means may also be provided to switch off both heating elements in the event of water within the cold water tank falling below a predetermined level.

Preferably a condenser is provided to condense steam produced by the boiling chamber to water which is returned to the hot or cold water tank. The condenser preferably comprises a primary condenser formed in the lid of the dispenser and in fluid communication with an enclosure positioned adjacent the

free end of the expansion pipe, the steam condensing to water in the lid, which water falls back into the enclosure surrounding the expansion pipe and from there into the hot water tank.

In a preferred embodiment the secondary condenser comprises a conduit extending from the primary condenser down onto a plate located slightly above the full level of water in the cold water tank so that steam not condensed in the primary condenser passes down the conduit onto the plate and is condensed to water which then falls into the cold water tank.

The present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a boiling water dispenser in accordance with the present invention; and

Figure 2 is a perspective view of an upper part of the dispenser illustrated in Figure 1.

A boiling water dispenser as illustrated in Figures 1 and 2 comprises an outer rectangular casing 20 having a base 21 and enclosed by a rectangular lid 22. Within the upper part of the casing 20 there is located a rectangular cold water tank 23 which is fed with cold water via an inlet pipe 24 and controlled by a conventional float valve 25. A hot water tank 26 is located beneath the cold water tank 23 and is bordered by the base of the outer casing 21 and insulating wall portions 27. An outlet pipe 28 which may be in the form of a dispensing tap (not shown) is positioned in the base of the container to allow hot water to be released from the hot tank 26.

Within the lower part of the hot water tank 26 is located a boiling chamber 31 which comprises a copper cylinder 32 mounted with its axis horizontal and arranged to contain a pair of electrical heating elements 34 and 35 which are secured at one end in one end face 37 of the cylinder. The end face 37 of the cylinder is connected to the base of the cold water tank 33 via a conduit 38 which extends through the side wall 27 of the hot water tank. The opposite end 40 of the boiling chamber 31 is provided with a vertically extending expansion pipe 42 which extends up through the hot water tank 26 and terminates within an open ended cylindrical enclosure 43 which

is located in an inverted fashion over the end 44 of the expansion pipe 42. The end 44 of expansion pipe 42 is arranged to be above the full level of water in the cold water tank 23. The level of water in the cold water tank is controlled by the ball valve 25 and an overflow pipe 48 is also provided to ensure against overfilling of the cold water tank due to breakdown of the float valve.

To operate the dispenser the tank 23 is filled with cold water via the inlet 24 and this cold water pours into the boiling chamber 31 via the conduit 38 and up the expansion pipe 42 to find a static level which is common with the level in the cold water tank. At this stage the hot water tank is effectively sealed from the boiling chamber 31 and is empty because the free standing level of the water in the expansion pipe 42 is below the upper end 44 of the pipe. If the power is then switched on the electrical heating elements 34 and 35 heat the water within the boiling chamber and the hot water circulates to the top of the expansion pipe 42. Eventually the water within the boiling chamber boils and this has the effect of causing the level in the expansion pipe to rise until the water cascades (arrowed in Figure 1) over the upper end 44 and down within the enclosure 43 to fall into the base of the hot water tank 26. The water which falls in the hot water tank 26 is maintained in a boiling condition by heat from the heating elements 34 and 35 which is conducted through the brass walls of the boiling chamber 31.

As boiling water percolates from the boiling chamber 31 via the expansion pipe 42 it is replenished with cold water at

the opposite end 37 of the chamber 31 via the conduit 38 connected to the cold water tank 23. Eventually the hot water tank becomes full of boiling water to a level at which the boiling water enters a sealed cylindrical enclosure 50 positioned in the cold water tank and fed via a conduit 51 which extends into the hot water tank 26 as shown in Figure 1. A float 53 is provided in this sealed chamber 50 so that as the hot water enters this chamber the float is lifted to actuate by tilting a first mercury switch 54 via an arm and spring arrangement 55. Actuation of the first mercury switch 54 causes the power to be cut off from the primary heating element 35 thereby maintaining the pilot element 34 to maintain the water in the hot tank at boiling temperature but not causing boiling water to be ejected from the expansion pipe 42. When in this condition the dispenser contains a full tank of boiling water which can be drawn off from the outlet 28 whilst at the same time contains cold water in the cold water tank to replenish any boiling water which may be periodically removed.

As boiling water is dispensed via the outlet 28, the level in the sealed enclosure 50 drops and accordingly the float 53 re-actuates the mercury switch 54 to allow the heating element 35 to operate thereby causing further percolation of boiling water out of the expansion pipe to top up the hot water tank.

The dispenser also includes a safety device to ensure that neither heating element will operate in the event of failure of the cold water supply. A cylindrical enclosure 60 is located adjacent the inlet 24 of the cold water tank and is provided with a float 61 connected via an arm and spring

arrangement 62 to a second mercury switch 63. If the level of cold water within the sealed chamber 60 drops below a predetermined level, the float sinks to a level at which the secondary mercury switch is closed cutting off all power to both heating elements 34 and 35 and therefore ensuring against damage to the heating elements. The enclosure 60 surrounding the float 61 is provided to ensure that water entering the cold water tank does not cause undue turbulence of the float 61.

Another feature of the boiling water dispenser is provision of primary and secondary condensers in the roof of the unit to ensure that steam generated by the boiling chamber 31 is condensed into water which is returned to hot water and cold water tanks. As shown in Figure 1 the enclosure 43 of the expansion pipe 42 terminates at one end into an outlet pipe 70 which is connected to the lid 22 of the container via a pipe 71.

Figure 2 is an illustration of the cold water tank and lid assembly 22 and illustrates the primary and secondary condensers. The rectangular lid 22 is constructed of copper and has a metal base 81 which locates upon a ledge 82 provided in the top of the cold water tank 23. The pipe 71 feeds the steam from the enclosure 43 into a chamber defined by the roof 80 constituting the primary condenser within the space enclosed within the lid 22. As the steam which escapes from the expansion pipe 42 passes up the pipe 70 and into the primary condenser via the pipe 71, the majority of the steam condenses into water droplets which collect on the base plate 81 and pour

back down the pipe 71 into the enclosure 43 and from there into the hot water tank.

However, some steam may not condense into droplets and this steam escapes from the primary condenser via a pipe 85 down onto a small brass plate 86 located in the side wall of the cold water tank 23 adjacent the upper level of cold water and constituting the secondary condenser. The cold water has the effect of reducing the temperature of the brass plate 86 so that any remaining steam which does descend the pipe 85 immediately condenses into droplets which fall off the plate 86 into the cold water tank.

The provision of dual condensers ensures that there is no escape of steam from the dispenser and the secondary condenser particularly ensures that the steam does not circulate within the cold water tank to a) raise the temperature of the cold water; and b) affect the sensitive mercury switches.

The dispenser described above is capable of quickly producing boiling water because a small quantity of water is initially heated to boiling point in the comparatively small boiling chamber. The dispenser is also capable of storing boiling water in the hot water tank whilst using only a pilot element 34. As boiling water is drawn off the dispenser, cold water does not enter the hot water chamber but enters the boiling chamber and therefore the temperature in the hot water tank should not drop below boiling point. Furthermore, various safety devices ensure that there is no danger that the elements will burn out due to water failure or that overflow of either the hot or cold water tank can take place. The dual condensers

ensure there is no escape of steam so that the device can be used within a room without danger of escaping steam damaging room furnishings. Since the cold water is fed into a cold water tank any sediment or scale that may enter via the cold water inlet settles in the base of the tank and is unlikely to be fed into the boiling chamber and hot water tank.

If the dispenser is switched off with water in the hot water tank and then switched on again when the water has cooled, the cold water can be drained from the hot tank thereby causing the primary element to operate to quickly produce boiling water.

The dispenser described above may simply be mounted on a wall, plugged into a supply of electricity and mains water to produce a completely automatic, economical and efficient boiling water dispenser which is both clean, safe and very hygenic. Not only can boiling water be quickly produced but the hot water tank is sufficiently large to cater for a substantial demand without a drop in temperature of the water output. The dispenser is considered particularly useful for schools, restaurants and hotels where boiling water is frequently required in varying quantities at periodic intervals.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A boiling water dispenser comprising a cold water tank for cold water in fluid communication with a boiling chamber, said boiling chamber being positioned within a hot water tank for hot water and having heating means to boil the water, the boiling chamber having an upwardly extending expansion pipe which is arranged in use to feed the boiling water to the hot tank only when the water boils in the boiling chamber, said expansion pipe having a free end which is located in an upward extension of said hot water tank, and an outlet positioned in the hot tank to allow boiling water to be dispensed from the dispenser, the water within the hot water tank being maintained at boilding temperature due to conduction of heat from the heating means through the boiling chamber said dispenser further including a steam condensing chamber which is connected to said upward extension so as to receive steam therefrom and return condensed water thereto, said condensing chamber having a steam outlet which communicates with the cold water tank, whereby uncondensed steam passes from the condensing chamber to the cold water tank.

2. A dispenser according to claim 1, wherein the free end of the expansion pipe terminates at a level above the normal static level of water in the cold water tank so that water only escapes to the hot water tank by overflowing from the free end of the expansion pipe due to thermal expansion of the water in the boiling chamber.

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3. A dispenser according to either claim 1 or claim 2 wherein the cold water tank is positioned above the hot water tank and the boiling chamber comprises an enclosure fed at a conduit from the cold water tank and having the expansion pipe extending upwardly.

4. A dispenser according to claim 1, wherein a primary heating element and a pilot heating element are positioned within the boiling chamber.

5. A dispenser according to claim 4, wherein a primary switching means is provided to sense the level of boiling water in the hot tank so that at a predetermined level the primary heating element is cut off leaving only the pilot element to maintain the water within the hot tank at boiling temperature.

6. A dispenser according to claim 5, wherein the switching means comprises a float within a chamber located within the cold water tank, the float being connected to a mercury switch so that when the level within the float chamber reaches the predetermined level, the mercury switch switches off the primary heating element.

7. A dispenser according to claim 4, wherein a further switching means is provided to switch off both heating elements in the event that the water within the cold water tank falls below a predetermined level.

8. A dispenser according to claim 7, wherein the further means comprises a float coupled to a mercury switch and positioned within the cold water tank.

9. A dispenser according to claim 1, wherein the level of water in the cold tank is controlled by a float valve.

10. A dispenser as claimed in claim 1, 2 or 4, wherein the steam outlet of the condensing chamber includes a conduit which has its lower end in the cold water chamber and wherein a condensation plate is located adjacent to the lower end of said conduit, said plate serving o condense steam issuing from said conduit.

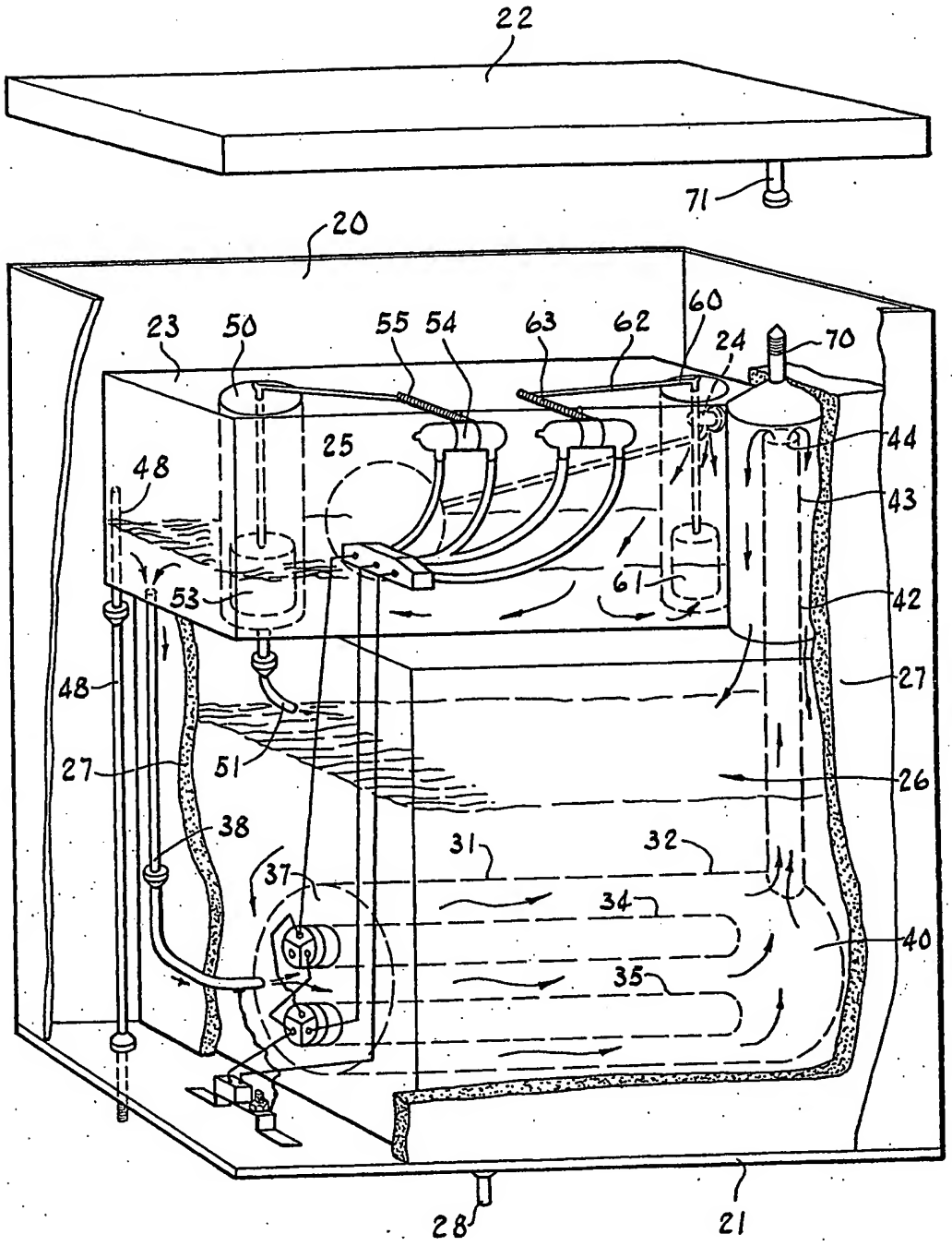

FIG. 1

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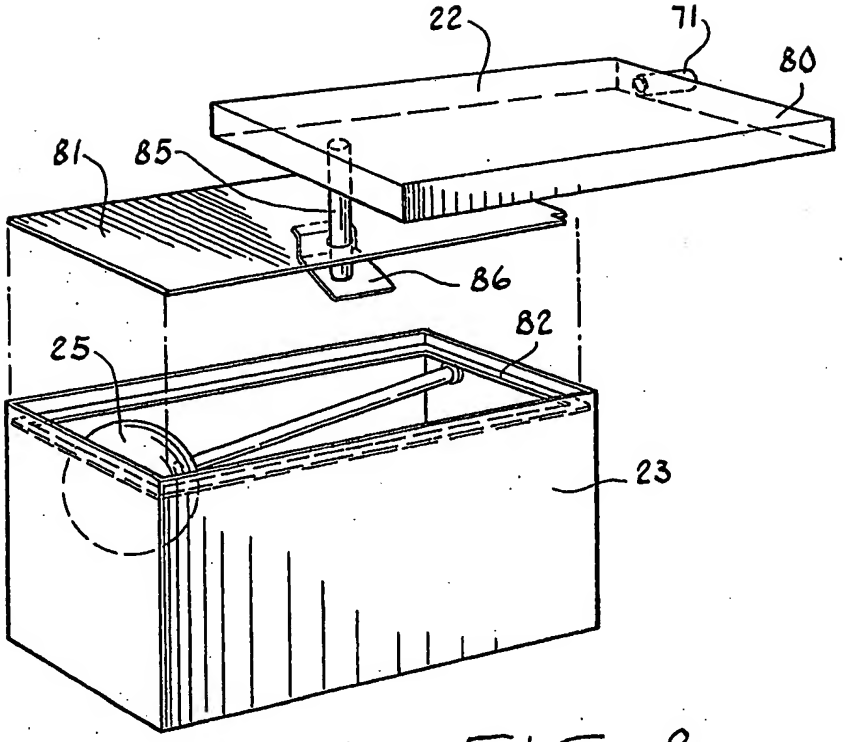

FIG. 2

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